

Stennis Space Center Engineering and Test Directorate Overview

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Engineering and Test Directorate



History of Stennis Space Center

John C. Stennis Space Center was established to test the engines used to propel the Apollo space craft to the moon.

- **Construction date—May 1963**
- **Mississippi Test Facility established—April 23, 1966**
- **Hancock County, Miss. provided access to**
 - Isolated test site
 - Water and road access
 - Public utility
 - Supportive community
 - Climate conducive for year-round testing
- **First and second Saturn V stages were tested from 1967-1972**
- **Renamed John C. Stennis Space Center in 1988**
- **Nation's largest rocket engine testing facility**

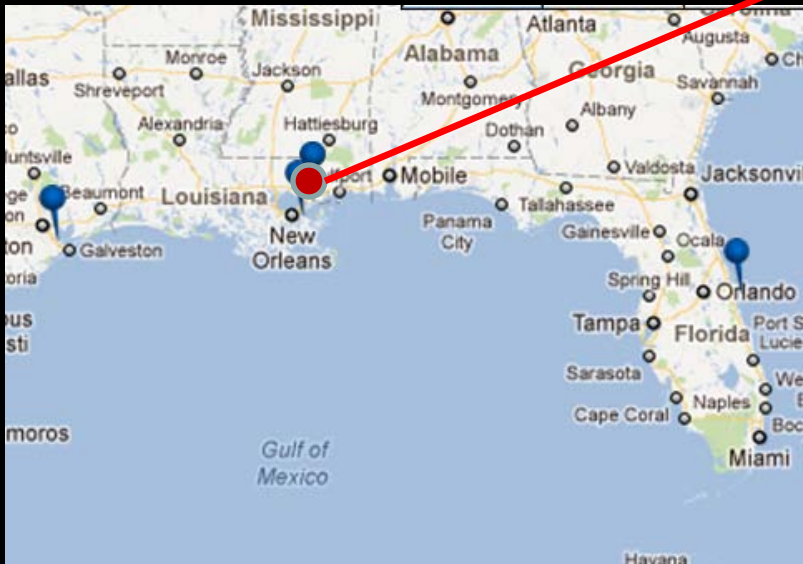
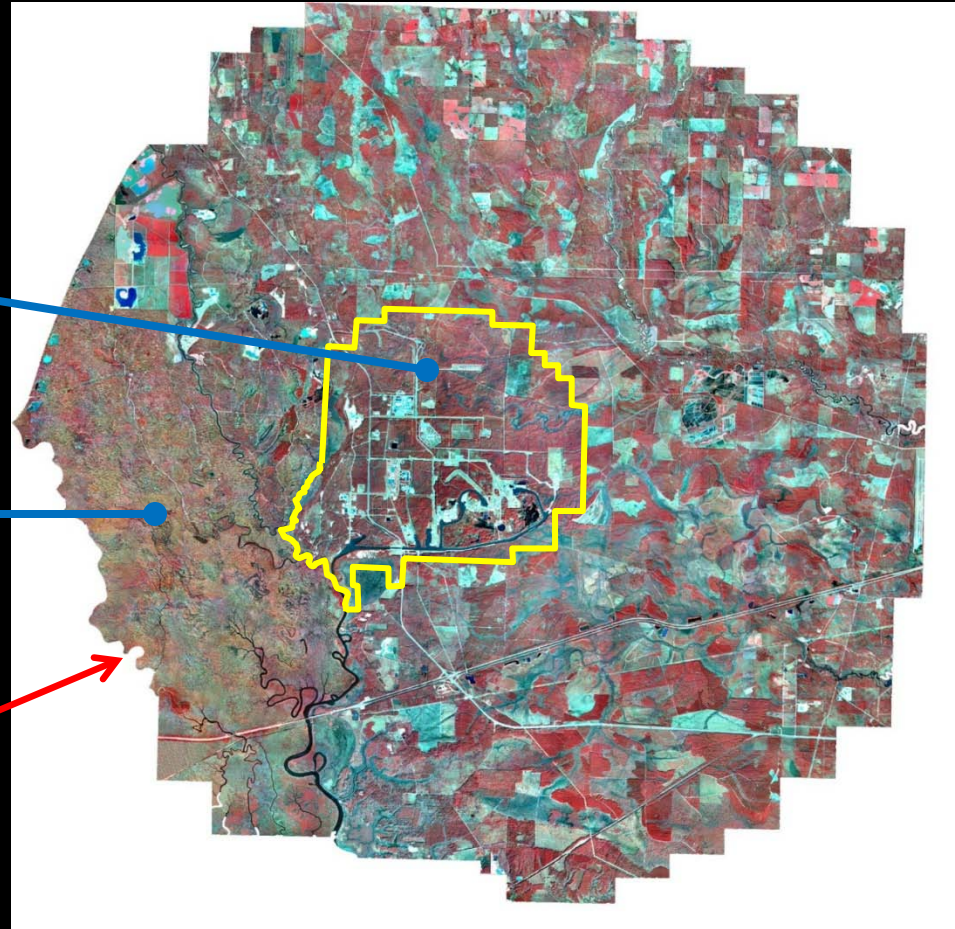
"I don't know yet what method we will use to get to the moon, but I do know that we have to go through Mississippi to get there!"
-Dr. Wernher Von Braun



Location

**13,800 Acre
Fee Area**

**125,000 Acre
Buffer Zone**



A Unique Federal City

More than 5,000 NASA, Contractor and Resident Agency Employees

- NASA
 - John C. Stennis Space Center*
 - 280 NASA Civil Servants
 - 1,420 NASA Contractors
 - NASA Shared Services Center*
 - The NSSC is collocated on site with 440 employees
 - 120 NASA Civil Servants
 - 320 NSSC Contractors
- NAVY
 - Commander, Naval Meteorology & Oceanography Command
 - Naval Oceanographic Office
 - Naval Research Laboratory
 - Naval Small Craft Instruction and Technical School
 - Navy Special Boat Team 22
 - Navy Human Resources Service Center Southeast
- More than 30 major federal, state, academic and private organizations
 - More than 60 technology-based companies

*employee numbers are approximate

Resident Agencies at Stennis Space Center



Department of Defense

- Commander, Naval Meteorology & Oceanography Command
- Naval Oceanographic Office
- Naval Research Laboratory
- Naval Small Craft Instruction and Technical Training School
- Navy Special Boat Team 22
- Navy Human Resources Service Center Southeast
- Mississippi Army Ammunition Plant
- Defense Contract Management Command

Department of Commerce

NOAA, NWS, National Data Buoy Center
NOAA National Marine Fisheries Service
NOAA National Coastal Data Development Center

Environmental Protection Agency

Environmental Chemistry Laboratory
Gulf of Mexico Program

Department of Interior

USGS Water Resources Division
USGS Geomagnetism Center

Department of Transportation

U.S. Coast Guard

Department of Energy

Strategic Petroleum Reserve

General Services Administration

State of Mississippi

Mississippi Space Commerce Initiative
Geo Resources Institute

State of Louisiana

Louisiana Technology Transfer Office

Mississippi Enterprise for Technology

Stennis Technology Enterprise Center

Institute for Technology Development

Spectral Visions

Commercial Companies

Pratt and Whitney Rocketdyne
Lockheed Martin, Mississippi Space and Technology Center
Rolls Royce North America

Major Contractors

Pratt and Whitney Rocketdyne
Jacobs Technology Inc.
Computer Sciences Corp.
Applied Geo Technologies
Paragon Systems Inc.
Science Applications International Corporation

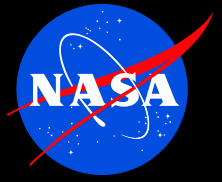
Center for Higher Learning

Mississippi State University
University of Southern Mississippi (USM)
USM Center for Marine Science
University of New Orleans
Pearl River Community College

University of Southern Mississippi - College of Marine Sciences

Dept. of Marine Science
Center for Ocean and Atmospheric Modeling

SSC Test Area



Rocket Propulsion Test Heritage

Apollo



Space Shuttle



Space Launch System

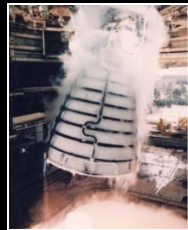


- **First Saturn V Rocket Engine Test Firing**
April 23, 1966

- **First Space Shuttle Main Engine Test Firing**
May 19, 1975

- **First J-2X Engine Component Test**
December 18, 2007

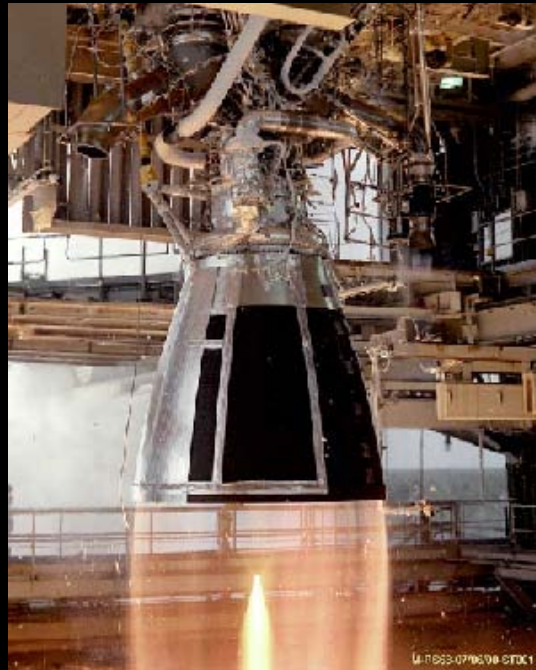
- **First J-2X Engine Test Firing**
July 14, 2011



Current/Recent Rocket Propulsion Testing Engines and Components



Space Shuttle Main Engine



RS-68 Engine



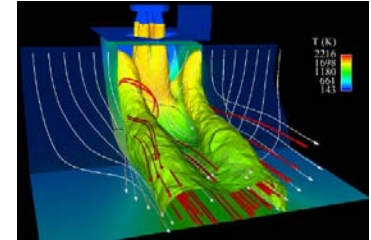
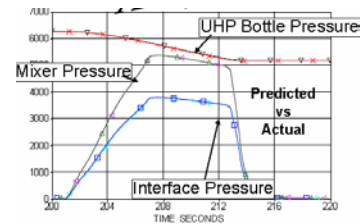
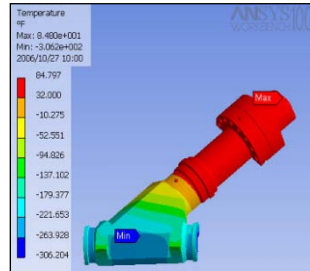
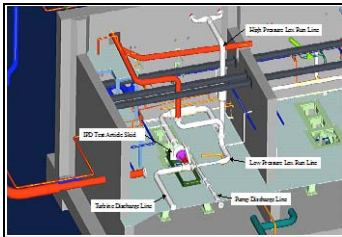
Orbital/ Aerojet AJ-26



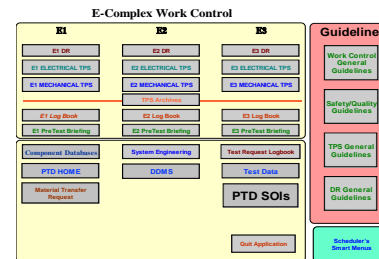
J-2X Engine

Technical Services For Testing

- Systems Engineering
 - *Requirements, Processes, Priorities, Integration, Life Cycle Reviews, ...*
- Design and Analysis



- Test Operations



- Support Infrastructure and Labs



Path to MBSE

- Transition
 - Moving from a traditional document centric engineering management system to a model centric architecture
 - Intent is to improve data configuration control, data accessibility and reduce costs
 - Effort is evolutionary – 10 years into transition
 - Design and Data Management System (DDMS)
 - Primary system tool is Windchill
 - Also includes a server system (for test data, video, large files) and a supercomputing cluster (HPCC – for running models and simulations)

SSC PDLM Environment

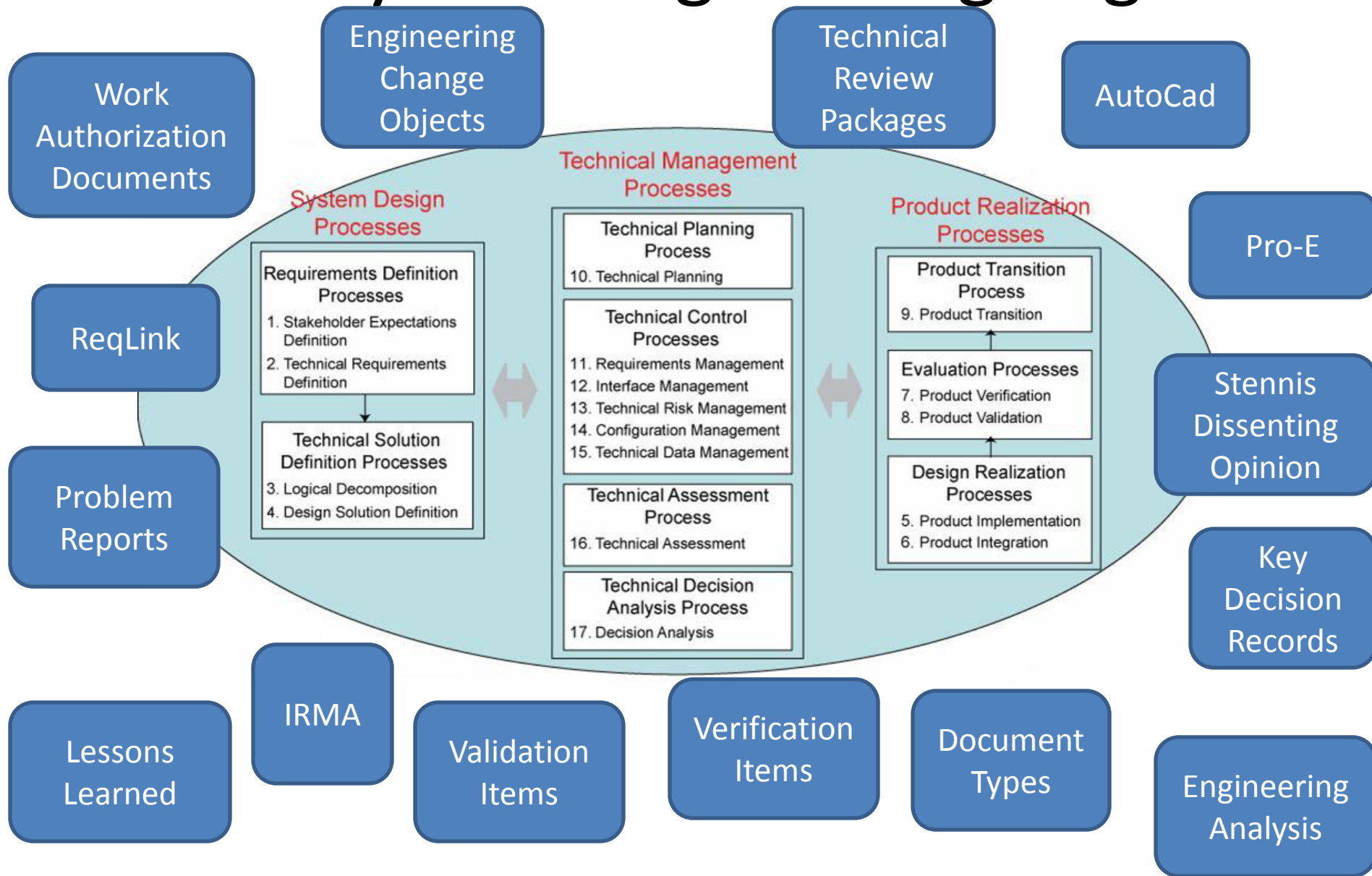
Windchill Based

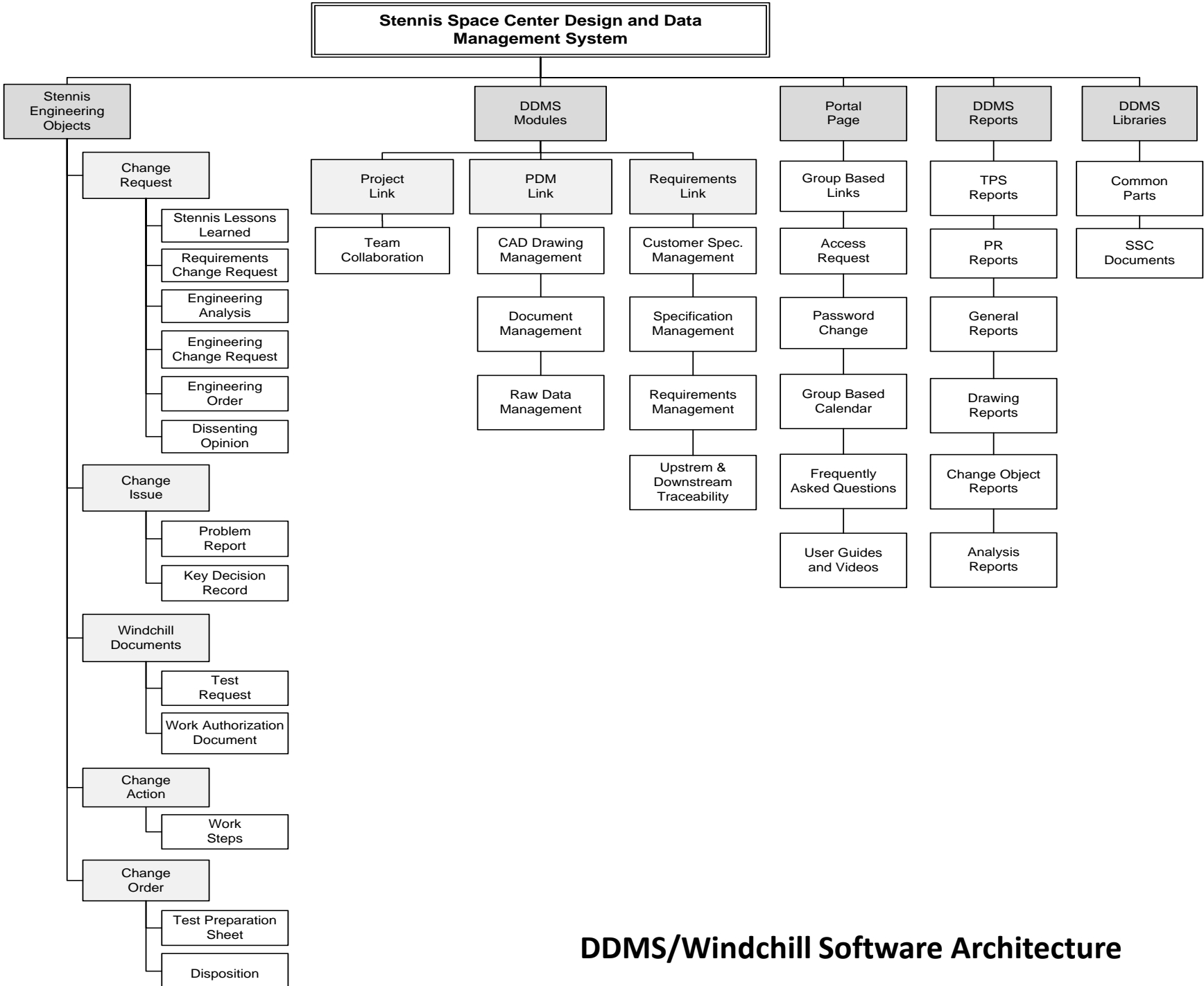


SSC PDLM Environment

- Center Level Implementation to manage project and facility designs and engineering data, allowing for integration capabilities with customers and partners
- Propulsion/Engine Testing is SSC's primary responsibility that requires high level of confidence in configuration of test facilities and control/data systems
- Drawing Centric – SSC has historically used primarily AutoCAD, but has started its evolution into Model Based System Engineering with extensive use of Pro-E and other support elements
- Manage design and data for SSC Projects (Commercial, DOD, NASA, Internal) based upon NPR7123.1 System Engineer processes

NASA System Engineering Engine





DDMS/Windchill Software Architecture

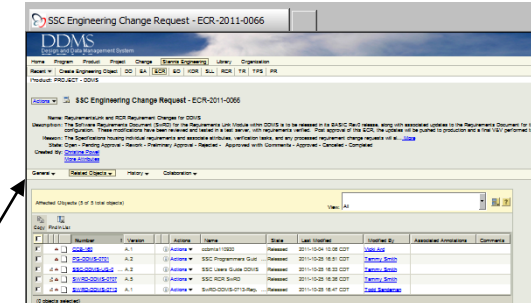
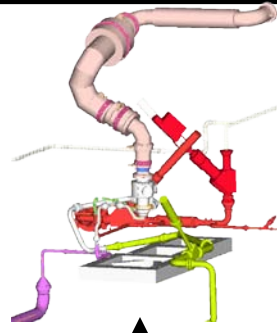
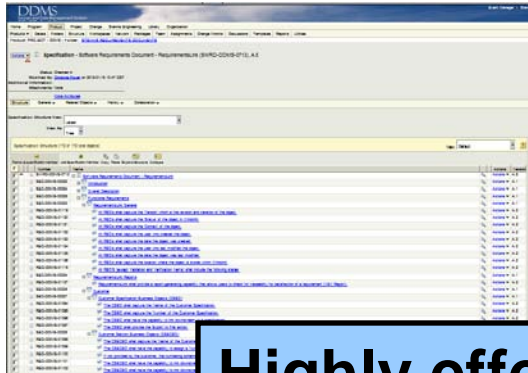
Integrated Data Environment

Stennis Space Center

Requirements Development and Management within DDMS/WindChill RequirementsLink

System Modeling in Pro-E <in work>

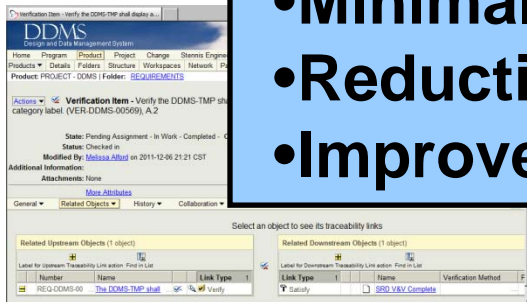
Change Management throughout the Project Life via Engineering Change Objects



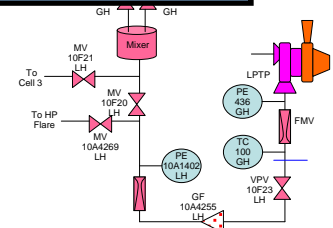
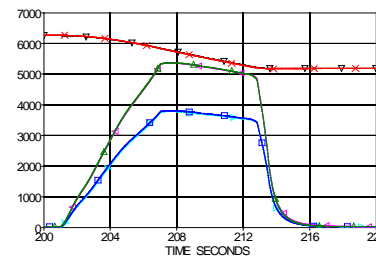
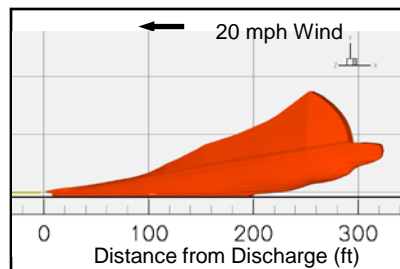
Highly effective integration of design and analysis functions, measured by

- Minimal design rework
- Reduction in facility activation testing
- Improved anomaly resolution timeline

Execution of Verification and Tracking for Bi-D



System and Test Data Analysis



Wrap-Up

- Successes

- Current State

- Consolidation of data tools and sets into a single digital environment
 - Includes requirements traceability and workflow automation
 - Includes migration of problem reports and work authorization documents from the heritage system

- Challenges

- Future State: 100% digital environment

- Work steps performed within tool environment
 - IT security for off site access for customer representatives
 - Momentum – maintaining forward progress
 - Funding, time, and manpower constraints

The Ultimate Goal

